

In re Patent Application of
FRUHAUF
Serial No. 09/686,327
Filed: OCTOBER 11, 2000

In the Claims:

This listing of claims replaces all prior versions and listing of claims in the application.

1. (currently amended) A multi-mode integrated circuit (IC) for operating in an ISO mode in accordance with International Standards Organization 7816 (ISO 7816) protocol, and a non-ISO mode in accordance with a non-ISO protocol, the multi-mode IC comprising:

- a processor;
- an external interface connected to the processor and comprising
 - a voltage supply pad,
 - a ground pad,
 - a first set of pads in accordance with the ISO 7816 protocol, and
 - a second set of pads in accordance with the non-ISO protocol; and
- a mode configuration circuit ~~connected to the switching block~~ for configuring the multi-mode IC in one of the ISO mode and the non-ISO mode based upon a signal on one pad of the first set of pads.

2. (previously presented) A multi-mode IC according to Claim 1 wherein the mode configuration circuit configures the multi-mode IC to operate in one of the ISO and non-ISO modes while disabling the other of the ISO and non-ISO modes.

3. (previously presented) A multi-mode IC according to Claim 2 wherein the first set of pads is disabled when the multi-mode IC is configured in the non-ISO mode, and the second set of pads is disabled when the multi-mode IC is

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configured in the ISO mode.

4. (previously presented) A multi-mode IC according to Claim 1 wherein the mode configuration circuit comprises:
a mode detector connected to the one pad of the first set of pads; and
a latching circuit connected to the processor and receiving an output from the mode detector.

5. (previously presented) A multi-mode IC according to Claim 4 further comprising a control register connected to the latching circuit for storing a mode configuration indicator.

6. (previously presented) A multi-mode IC according to Claim 4 further comprising a voltage detector connected to the voltage supply pad to detect a voltage supply of one of the ISO and non-ISO modes.

7. (previously presented) A multi-mode IC according to Claim 4 wherein the non-ISO mode comprises a Universal Serial Bus (USB) mode, and the second set of pads includes D-plus and D-minus pads in accordance with the USB protocol; and further comprising a USB cable detector connected to the D-plus and D-minus pads.

8. (previously presented) A multi-mode IC according to Claim 4 wherein the first set of pads includes a clock pad, a reset pad, and an input/output pad in accordance with the ISO 7816 protocol.

9. (previously presented) A multi-mode IC according to Claim 4 wherein the first set of pads includes a clock pad,

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a reset pad, a variable supply voltage pad, and an input/output pad in accordance with the ISO 7816 protocol; and wherein the mode detector comprises a pull-up resistor connected to the one pad of the first set of pads.

10. (previously presented) A multi-mode smart card for operating in an ISO mode in accordance with International Standards Organization 7816 (ISO 7816) protocol, and a non-ISO mode in accordance with a non-ISO protocol, the multi-mode smart card comprising:

- a card body; and
- a multi-mode integrated circuit (IC) carried by the card body and comprising
 - an external interface including
 - a voltage supply pad,
 - a ground pad,
 - a first set of pads in accordance with the ISO 7816 protocol, and
 - a second set of pads in accordance with the non-ISO protocol, and
 - a mode configuration circuit for configuring the multi-mode IC in one of the ISO mode and the non-ISO mode and comprising
 - a mode detector connected to one pad of the first set of pads, and
 - a latching circuit connected to the mode detector.

11. (previously presented) A multi-mode smart card according to Claim 10 further comprising a control register connected to the latching circuit for storing a mode configuration indicator.

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12. (previously presented) A multi-mode smart card according to Claim 10 further comprising a voltage detector connected to the voltage supply pad to detect a voltage supply of one of the ISO and non-ISO modes.

13. (previously presented) A multi-mode smart card according to Claim 10 wherein the non-ISO mode comprises a Universal Serial Bus (USB) mode, and the second set of pads includes D-plus and D-minus pads in accordance with the USB protocol; and further comprising a USB cable detector connected to the D-plus and D-minus pads.

14. (previously presented) A multi-mode smart card according to Claim 10 wherein the mode configuration circuit configures the multi-mode IC to operate in one of the ISO and non-ISO modes while disabling the other of the ISO and non-ISO modes.

15. (previously presented) A multi-mode smart card according to Claim 14 wherein the first set of pads is disabled when the multi-mode IC is configured in the non-ISO mode, and the second set of pads is disabled when the multi-mode IC is configured in the ISO mode.

16. (previously presented) A multi-mode smart card according to Claim 10 wherein the first set of pads includes a clock pad, a reset pad, and an input/output pad in accordance with the ISO 7816 protocol.

17. (previously presented) A multi-mode smart card according to Claim 10 wherein the first set of pads includes a clock pad, a reset pad, a variable supply voltage pad, and an input/output pad in accordance with the ISO 7816 protocol; and

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wherein the mode detector comprises a pull-up resistor connected to the one pad of the first set of pads.

18. (previously presented) A multi-mode smart card system for operating in an ISO mode in accordance with International Standards Organization 7816 (ISO 7816) protocol, and a non-ISO mode in accordance with a non-ISO protocol, the multi-mode smart card system comprising:

- a multi-mode smart card comprising
 - an external interface including
 - a voltage supply pad,
 - a ground pad,
 - a first set of pads in accordance with the ISO 7816 protocol, and
 - a second set of pads in accordance with the non-ISO protocol, and
 - a mode configuration circuit for configuring the multi-mode smart card in one of the ISO mode and the non-ISO mode and comprising
 - a mode detector connected to one pad of the first set of pads, and
 - a latching circuit connected to the mode detector; and
- a non-ISO-compliant smart card reader for reading the multi-mode smart card including
 - a smart card interface having a plurality of contacts for respectively mating with the voltage supply pad, the ground pad, and the second set of pads in accordance with the non-ISO protocol, and
 - a mode indication circuit for connection to the one pad of the first set of pads for providing a non-ISO mode indication signal to the mode detector of the mode configuration circuit.

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19. (previously presented) A multi-mode smart card system according to Claim 18 wherein the mode configuration circuit further comprises a control register connected to the latching circuit for storing a mode configuration indicator.

20. (previously presented) A multi-mode smart card system according to Claim 18 wherein the mode configuration circuit further comprises a voltage detector connected to the voltage supply pad to detect a voltage supply of one of the ISO and non-ISO modes.

21. (previously presented) A multi-mode smart card system according to Claim 18 wherein the non-ISO mode comprises a Universal Serial Bus (USB) mode, and the second set of pads includes D-plus and D-minus pads in accordance with the USB protocol.

22. (previously presented) A multi-mode smart card system according to Claim 18 wherein the mode configuration circuit configures the multi-mode IC to operate in one of the ISO and non-ISO modes while disabling the other of the ISO and non-ISO modes.

23. (previously presented) A multi-mode smart card system according to Claim 22 wherein the first set of pads is disabled when the multi-mode IC is configured in the non-ISO mode, and the second set of pads is disabled when the multi-mode IC is configured in the ISO mode.

24. (previously presented) A multi-mode smart card system according to Claim 18 wherein the first set of pads

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includes a clock pad, a reset pad, and an input/output pad in accordance with the ISO 7816 protocol.

25. (previously presented) A multi-mode smart card system according to Claim 18 wherein the first set of pads includes a clock pad, a reset pad, a variable supply voltage pad, and an input/output pad in accordance with the ISO 7816 protocol; and wherein the mode detector comprises a pull-up resistor connected to the one pad of the first set of pads.

26. (previously presented) A method of operating a multi-mode integrated circuit (IC) in an ISO mode in accordance with International Standards Organization 7816 (ISO 7816) protocol, and a non-ISO mode in accordance with a non-ISO protocol, the multi-mode IC including an external interface having a voltage supply pad, a ground pad, a first set of pads in accordance with the ISO protocol, and a second set of pads in accordance with the non-ISO protocol, the method comprising:

detecting whether one of an ISO-mode condition and a non-ISO-mode condition exists on one pad of the first set of pads;

configuring the multi-mode IC in the ISO mode and disabling the second set of pads when the ISO-mode condition is detected; and

configuring the multi-mode IC in the non-ISO mode and disabling the first set of pads when the non-ISO-mode condition is detected.

27. (previously presented) A method according to Claim 26 wherein detecting whether one of the ISO-mode condition and the non-ISO-mode condition exists on the one pad of the first set of pads comprises detecting whether one of

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the ISO-mode condition and the non-ISO-mode condition exists during a power-on-reset of the multi-mode IC.

28. (previously presented) A method according to Claim 26 further comprising verifying the non-ISO mode, when the non-ISO-mode condition is detected, by detecting a non-ISO-mode voltage on the voltage supply pad.

29. (previously presented) A method according to Claim 26 wherein the first set of pads comprises a reset pad, a clock pad and an input/output pad in accordance with the ISO 7816 protocol.

30. (previously presented) A method according to Claim 29 wherein detecting whether the ISO-mode or non-ISO-mode condition exists comprises detecting if a signal from one of an ISO-compliant interface and a non-ISO-compliant interface is present on the clock pad.

31. (previously presented) A method according to Claim 26 wherein the first set of pads includes a clock pad, a reset pad, a variable supply voltage pad, and an input/output pad in accordance with the ISO 7816 protocol.

32. (previously presented) A method according to Claim 26 wherein the non-ISO protocol comprises a Universal Serial Bus (USB) protocol.

33. (previously presented) A method according to Claim 26 further comprising storing a mode configuration indicator for indicating whether the multi-mode IC is configured in the ISO or non-ISO mode.